Form 154T, 6-66
Supersedes 154T, 2-65

PRICE 50¢

HUNTER
Lite-A-Line
WHEEL ALIGNER

INSTRUCTION MANUAL

- **INSTALLATION**
- **CHECKING**
- **OPERATION**

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PREFACE

The **Hunter Lite-A-Line** Wheel Aligner brings to the wheel alignment field the fastest, simplest and most accurate method of measurement known to the automotive trade. It is the ultimate in precision instruments, designed to check **camber, caster, toe, center-steering, turning-angle, king-pin inclination and wheel track,** with a minimum of time and effort.

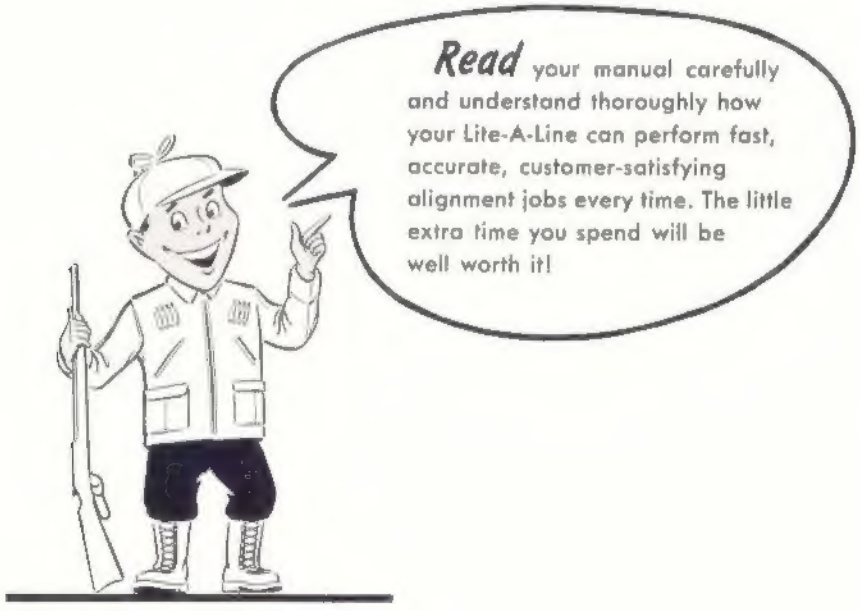
The **Lite-A-Line instrument** is an electric lamp projector with three sets of fine optical lens assemblies, each containing vertical and horizontal cross-hair lines similar to those used in surveying instruments. These cross-hairs are accurately adjusted at the factory. After the projectors are attached to the wheels of a car or truck by means of fast acting cam locks and the inaccuracies of the wheels are compensated with the **Run-Out Compensators,** the images of the cross-hairs (**Light Beams**) will indicate on the charts the true geometry of the wheels.

These outstanding features of the Hunter Lite-A-Line Wheel Aligner are unique in the field:

1. **PROJECTOR HEADS are rigidly constructed and scientifically adjusted at the factory and will maintain their accuracy indefinitely.**
2. **LIGHT BEAMS are weightless, absolutely straight lines which cannot be bent. They provide the most accurate form of straight line measurement.**
3. **CHARTS AND SCALES are precision finished and provide a graphic presentation of the front end geometry for both the mechanic and customer.**
4. **THE RUN-OUT COMPENSATOR quickly eliminates all error due to any lateral run-out condition so that the light beams represent the absolutely true geometry of the wheel.**
5. **A COMPLETE CHECKING PROCEDURE for the equipment can be quickly and accurately performed at any time in the field, assuring the mechanic that the original accuracy is being maintained.**

Use these features to your advantage. Careful handling and practice with the Lite-A-Line will give you confidence in the fact that you can get the fastest, most accurate wheel alignment readings obtainable.

The following is a complete discussion on installing, checking, and using the Lite-A-Line. This information will enable you to understand and use this equipment to the best advantage, allowing you to give your customers the most satisfying and accurate alignment service available.



•Installing the LITE-A-LINE

(A) TO SELECT LOCATION:

Select location where the sun or extremely bright light will not strike the charts to dim the light beams. Drive the car to this location, leaving about 7 feet of space from the center line of the front wheels to the wall, and about 3½ feet on each side of the front wheels. With chalk, mark places on the floor where the 4 tires touch. Make sure that this location gives you an accessible spot to move a vehicle. Back the car away from the chalk marks and draw lines on the floor according to the diagram shown in Figure 1.

It is advisable to select shop space with a reasonably flat floor. (Ideal conditions require a perfectly level floor, but this may not be absolutely necessary.) The Hunter Lite-A-Line can be used on the floor, but, of course, it is easier to make adjustments when used with a rack, pit installation, or lubrication hoist. No matter what installation you choose, the location of the charts in relation to the car is the same.

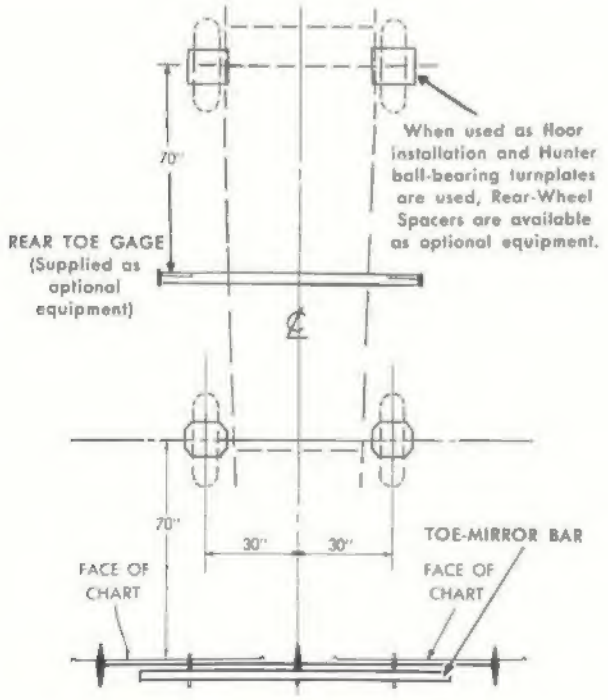


FIGURE 1

The minimum **width** required for the charts is 13⅓ feet. The minimum **length** required for a floor, pit or power-rack installation (for a large standard passenger car) is 21'6"; for an 8" rack 23'6"; and for a 24" adjustable-width rack 30'3".

(B) TO SET UP THE CHARTS:

Figure 2 shows the approximate dimensions and locations of the chart frame clamps. Check these dimensions on your equipment and set the charts up accordingly. The screws in the feet castings are for plumbing the faces of the charts **only** to correct for lean forward or backward. (Not for leveling) To set up charts of truck conversion groups, see Figure 3.

(C) TO LOCATE CHARTS:

Accurately position the charts and toe gage on a solid, reasonably level floor according to the diagram shown in Figure 1. Chalk around the feet of charts and toe gage. Remove the charts and toe gage, and **paint** the spots inside all the chalk lines. This method gives you quick re-set-up if equipment is moved.

(D) TO LEVEL TURNPLATES AND RACKS:

Be sure turnplates are leveled cross-wise. Place a straight-edge about 5 feet long across the turnplates. Level with a carpenter level placed exactly between the turnplates, or if a 4' level is available, place level on turnplates as shown in Figure 4.

If available, the most accurate way to level a rack is with a surveyor's transit. On a floor installation, if a floor

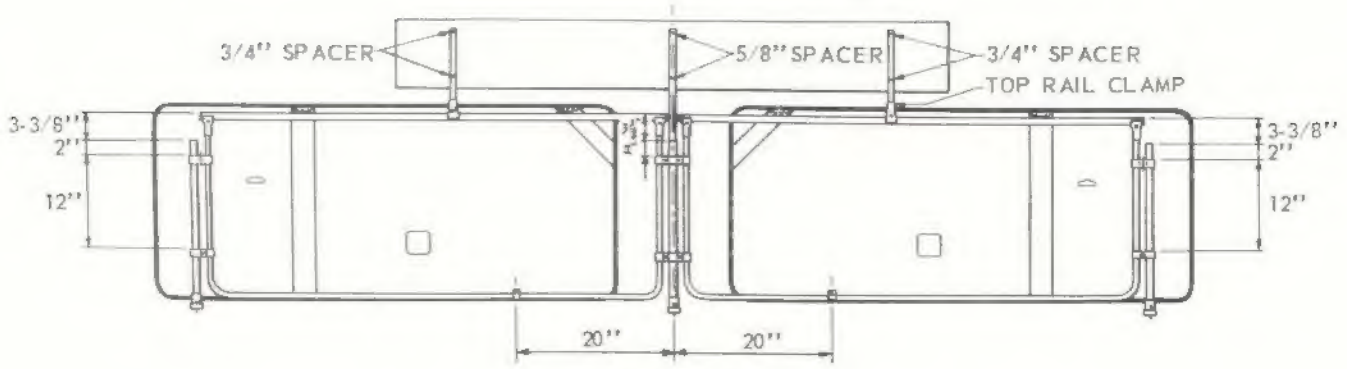


FIGURE 2

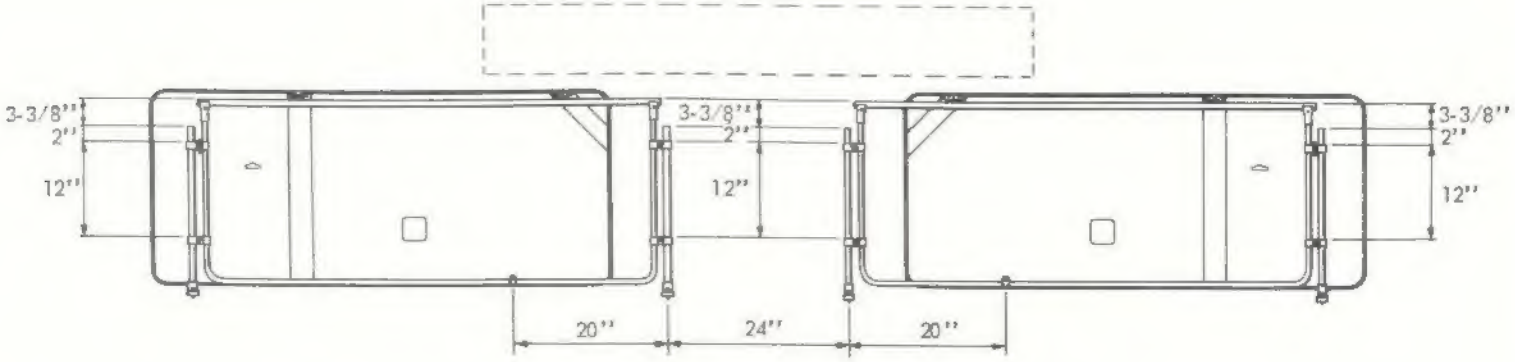


FIGURE 3

is not level, packing shims may be used under turnplates to level them.

Be sure racks are level length-wise and cross-wise. On a floor operation, if a floor is not level, shims may be used to raise the rear wheels to the same level as the turnplates. (Rear wheel spacers are available as optional equipment.)

(E) INSTALLING PROJECTOR HANGER:

The Hunter Lite-A-Line projector hanger can be mounted on your Hunter cabinet, a bench top, or on the wall. Select the most convenient mounting for using your Lite-A-Line equipment. Attach the support brackets (as shown in Fig. 5), and complete the installation of the unit. Projector rods fit into the matching holes of projector hanger to hold projectors safe and secure when not in use. After hanger is installed, adjust it by slightly bending hanger brackets, so that projector, when installed in hanger, is in a plumb position.

FIGURE 4

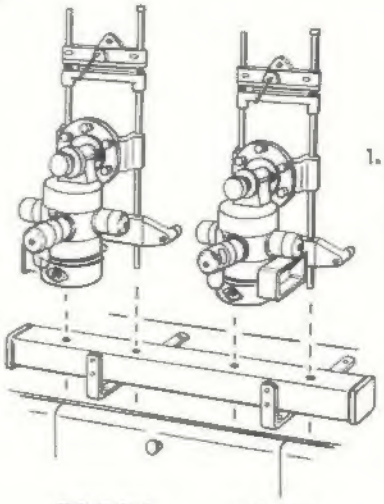
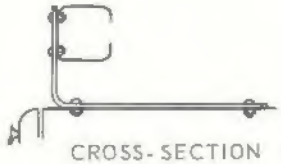


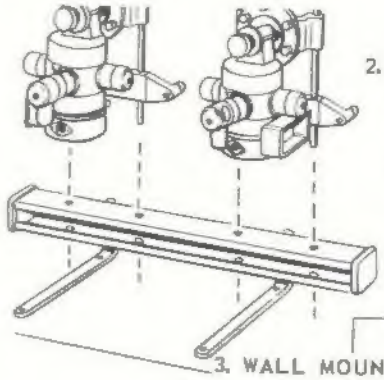
FIGURE 5

1. MOUNTING ON HUNTER CABINET

Bolt brackets to cabinet through matching holes in cabinet top.



CROSS-SECTION



2. BENCH MOUNTING

Projector hanger does not have to be attached to bench top, unless desired.

FIGURE 6

CROSS SECTION

3. WALL MOUNTING

Attach hanger unit to wall with correct type screws for corresponding type of wall material.

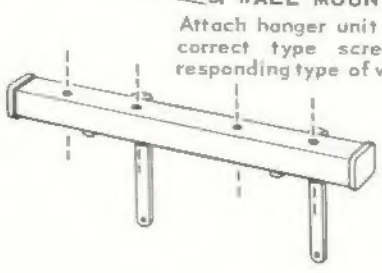
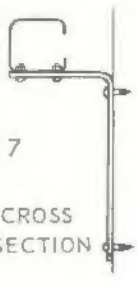


FIGURE 7



CROSS SECTION

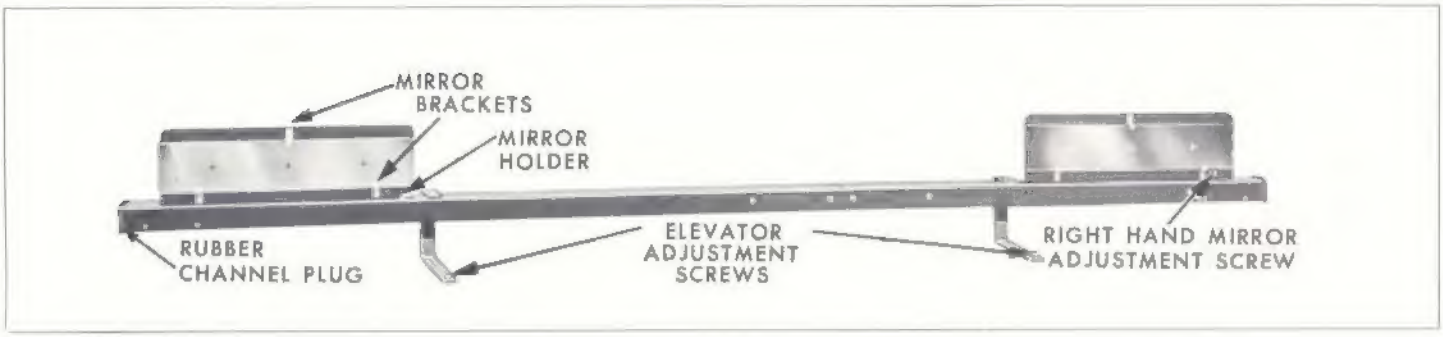


FIGURE 8

(F) ASSEMBLING TOE-MIRROR BAR:

First, assemble the 2 channels together with splice section, as shown in Figure 8. Then assemble the 2 legs onto the channel assembly as shown above. Install rubber channel plug on each end of channel. Bolt on left-hand mirror holder as in photo. Next, install **left**-hand mirror, making sure there is not any dirt or foreign matter between the three metal dimples on mirror holder and the glass. Bolt this left-hand mirror on permanently with the 3 mirror brackets. (Make sure the brackets are installed in a square postion, **directly** over dimples.) **Do not tighten these 3 brackets too tight — Do not deform or crack mirror.** Next, bolt on right-hand mirror holder and install adjustment screw as in Figure 9. Bolt on **right**-hand mirror the same way you did the left-hand mirror, **but do not snug** up the right-hand mirror brackets. Leave them a little loose so you can **slide the right-hand mirror** when adjusting and checking the toe mirror gage. **For checking instructions,** see Section 10, page 8.

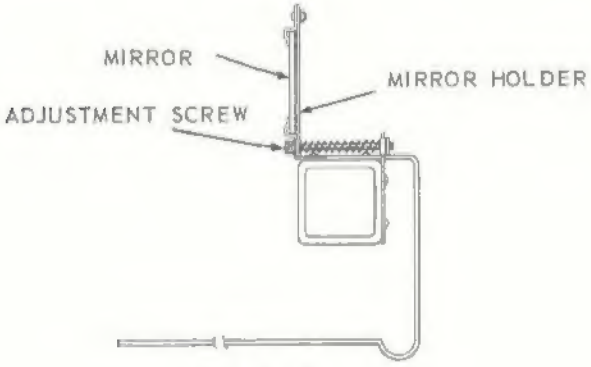


FIGURE 9

(G) TO LEVEL CHARTS:

Make sure the chart feet are on solid footing and on the marked spots on floor. Slide the charts back and forth to be sure the rollers are properly positioned on top frame rails. Loosen the adjusting handle on the outside end of one of the frames and move end of frame up or down until **level bubble** is exactly centered, then tighten adjusting handle. (See Figure 10.) (On alignment units which have an upper cabinet or shadow shelf, adjust level of charts by turning adjustment screws with L wrench. These adjustment screws are located on top of shadow shelf or in outside corners of cabinet interiors). Check these level bubbles often to be certain the charts are always level. Then adjust other front chart for level. It is important to note that the calibration of the charts is no more accurate than the leveling of the charts as they are based on a level reference.

FIGURE 10

(H) TO USE BALL-BEARING TURNPLATES:

After the front wheels have been jacked up and compensated, place the 2 turnplates under the wheels. Be sure the turnplates are centered under the wheels and that the 2 pins are in the turnplates. Lower the front wheels onto the turnplates, remove the pins and shake down the car. (It is important that the front wheels are **centered** on the turnplates.)

•Checking the LITE-A-LINE

1. **TO CHECK LEVEL BUBBLES ON CHARTS:** First, adjust chart feet screws for plumbing the chart faces, as explained in Section B, Page 3. Slide the charts back and forth to make sure the rollers are properly positioned on top frame rails. Adjust charts by using adjusting handles so that the **vertical red toe lines** are **plumb,** using a good carpenter level, plumb-bob, or even a bolt tied to a string. (See Figure 11.) Then check level bubbles for accuracy. If the bubbles are not **exactly** centered, loosen the screws holding the level barrels and adjust properly. Hence, when the level bubble is centered, the vertical red toe line is exactly vertical.

   These levels are carefully adjusted at the factory; however, for precision wheel alignment, we suggest rechecking for possible change during shipment.

   The calibration of the charts is no more accurate than the leveling, as they are based on a level reference.

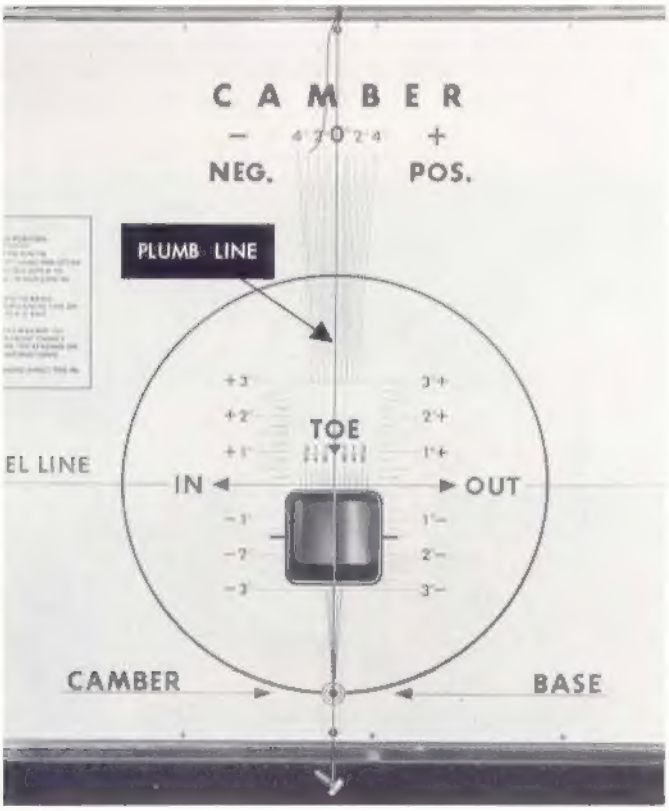


FIGURE 11

2. **TO CHECK REAR TOE GAGE (Supplied as an accessory):** Use a carpenter square to check the squareness of the flags with the toe gage channel. (See Figure 12). It may be necessary to straighten or shim the flags if they are bent.

3. **TO CHECK PROJECTOR ADAPTOR ASSEMBLY:** First place projector on the floor or rack and slide **center casting** of projector (See Figure 13) on rods to approximate **center** between top and bottom casting. Check

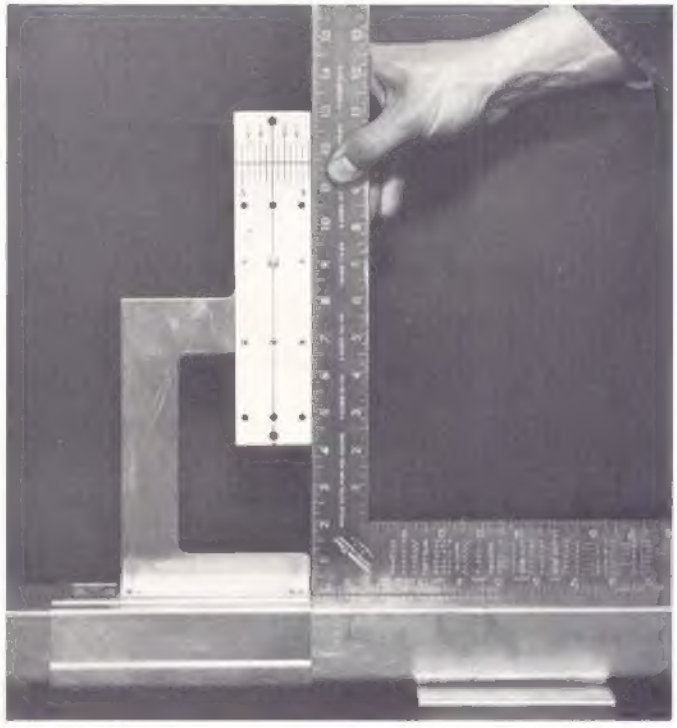


FIGURE 12

for play between center casting and rods, by feeling with your fingers while moving projector head up and down (Do not mistake compensator springs flexing for looseness). Check the four **pressure pins** and screws on center casting and on top casting for enough snugness so that they slide **very firmly** along the rods when pushed with your thumbs. Check tightness of all screws that hold rods and rim buttons.

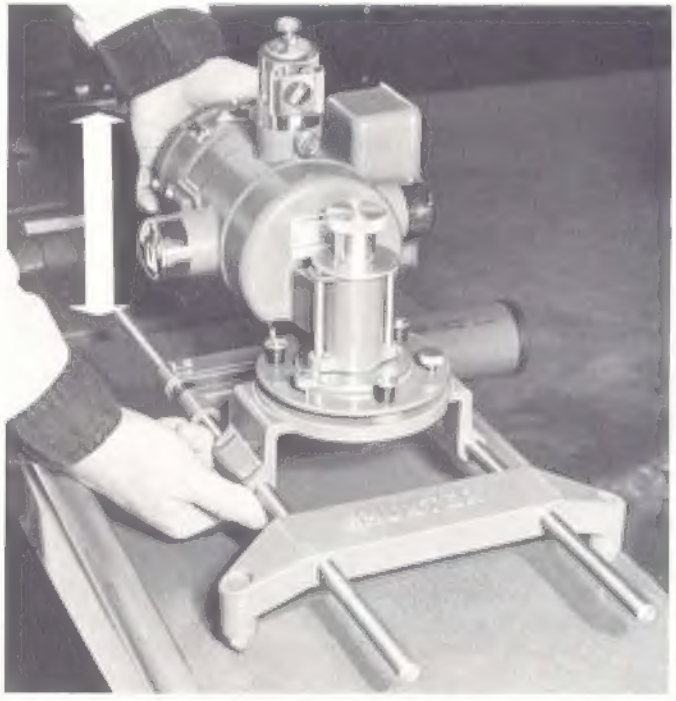


FIGURE 13

4. **TO CHECK COMPENSATOR ASSEMBLY:** Check the three compensator **plate springs** under the **compensator plate** for loss of strength or breakage. Run the compensating screws into neutral position with just the ball-ends of the screws entirely visible. Check the compensator assembly for looseness or weakness. A loose compensator assembly may be caused by a broken compensating spring or loose **bearing shaft.** The two nuts on the back of the shaft should be tight.

5. **TO CHECK COMPENSATOR BEARINGS:** Slide **center casting** of projector down to contact **bottom casting** and relocate the projector on the floor or rack. Check firmness of the positioning. Check compensator **bearings** for end play and for side play in bearings by gently moving end of projector head up and down and feeling for looseness. (See Figure 14) No play should be noticed.

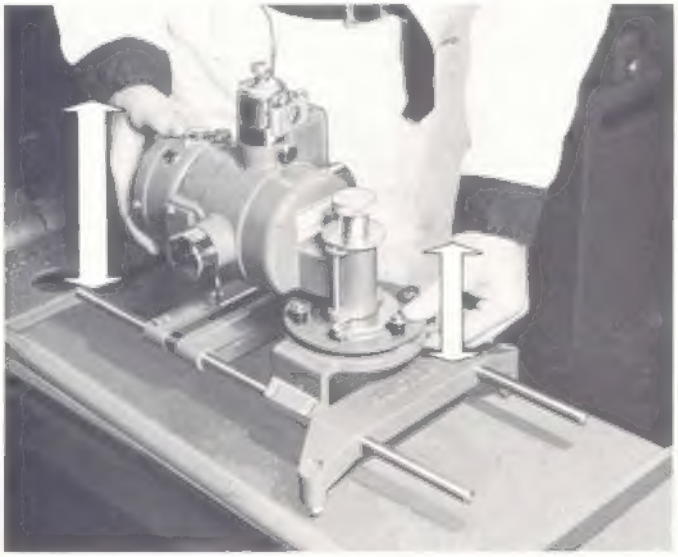


FIGURE 14

6. **TO CHECK PROJECTOR HEAD (LIGHT BEAMS):** Before returning a projector to the factory , repeat the following checks **several** times as carefully as possible to make absolutely certain the projector needs factory service. These projectors are rigidly constructed and scientifically adjusted at the factory, and, except in cases of damage or abnormal abuse, the accuracy of the light beams and projector will be maintained indefinitely.

   Note: From this point on, the projector must be **handled** extremely **carefully** and gently as not to move the projector at all in its position. By such handling, you will be able to assure yourself that you can use the equipment correctly and that it is accurate.

   CAUTION: Light bulbs are not designed to operate upside-down, so do not turn projector heads upside down while light bulbs are on.

   When reading and checking the light beams, use the center of the lighted lines as the spot to take readings (Width of line is for clarity and brightness and the center or middle of the line must be used for readings). For all readings, except camber, use the **spot** where light beams **cross** to take readings.

7. **TO CHECK ONE OF THE FOUR CAMBER LIGHT BEAMS:** First, place projector on floor or rack, with rods parallel to front charts, and about 6' away (There must be a hard, solid footing for rim buttons). Now, check compensator assembly as in Section 4. above. Plug in the lamp unit and turn on. Point a light beam toward the chart and pencil a **mark** where the light beams **cross.** Slowly and carefully (by gently holdng cord) (See Figure 15) move the projector head through a **small arc** so the light beam moves along the mark.

   If the light beam does not **remain** on the marked spot as the head is swung (providing the whole assembly is not moved, shifted, or tilted in location) the **camber beam** (now horizontal) is not properly aligned and must be adjusted at the factory. Repeat this procedure for the camber beam on the opposite side of the head.

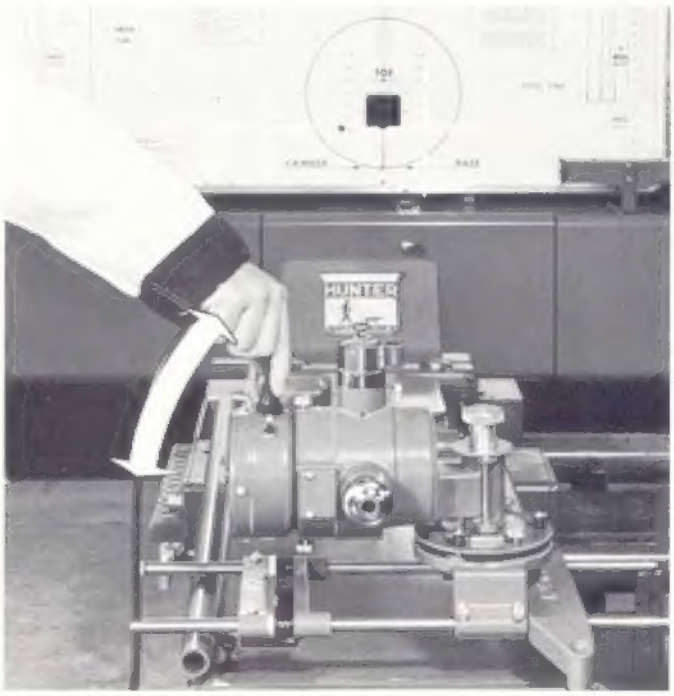


FIGURE 15

8. **TO CHECK ONE PAIR OF THE FOUR TOE LIGHT BEAMS:** Use the same marked spot that was made in above operations. Holding cord as in Figure 16, slowly and carefully swing the projector head **180°** so that **opposite light beam** crosses on the mark.

   If the opposite light beam does not **cross** on the mark (it is either above or below), first adjust a compensator screw so that the beams cross on the mark, then swing back 180° to original position. If, after several times, the light beam and its opposite light beam do not cross on the same mark (providing the whole assembly has not moved, shifted, or tilted in location) the pair of **toe light beams** are not properly aligned front to rear and must be adjusted at the factory.

9. **TO CHECK ONE OF THE TWO CASTER LIGHT BEAMS:** With wheels in straight-ahead position, the "X" lite-line should be approximately 1⅛" away from the vertical lite-line, in the direction toward which the caster barrel points. (See Figure 37.) (The "X" lite-line will then be on the caster scales when the vertical lite-lines are on the 20° turn lines.)

To adjust position of caster mirror, insert L-wrench in socket of adjustment screw on caster-mirror assembly and turn to position as explained above. (Before making adjustments, check to see that top of caster-mirror assembly is centered with caster adjustment screw.)

CARE OF CASTER INSTRUMENT: To keep the light intensity of your "X" lite-line bright, keep mirror, outside and inside lens-barrel lenses clean.

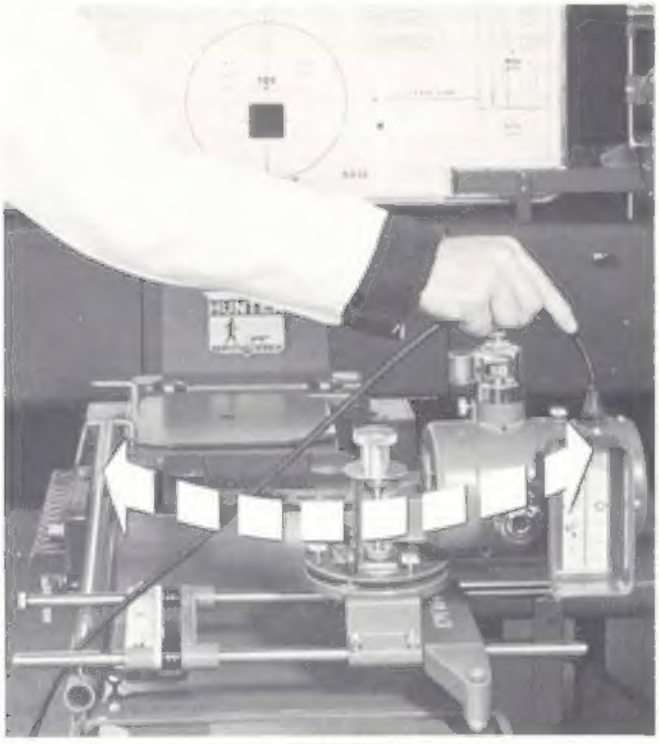


FIGURE 16

10. **TO CHECK TOE-MIRROR BAR:** Remove the 2 front charts and place toe-mirror bar assembly in back of chart frames, with mirrors facing you and with the 2 leg brackets of the toe-mirror bar in the 2 toe bar channels (See Figure 17).

Bolt the two channels onto cabinet or onto toe-mirror supports.

IMPORTANT: After the toe-mirror bar is placed in position, it should never be moved or lifted. The only time it should be moved is when it is being slightly

FIGURE 17

FIGURE 18

repositioned while checking for toe, as outlined in Section F, Page 12.

First, place **Peep Gage** directly in front of toe mirror bar, so that crosses on both mirror bar and peep gage are about ⅛" apart. (See Figure 18.) Look between the mirror and the peep gage on the **left** end of mirror bar and line up the **vertical** line of the **center cross** on the peep gage with the **vertical** line of the **center cross** on the toe mirror bar. **Slide right mirror,** (making sure peep gage and toe mirror have not been moved) so that the **vertical** lines of the 2 center crosses line up perfectly, while viewing between them. Tighten up right hand mirror brackets but **do not tighten too tight—Do not deform or break mirror.**

Now, in order to make sure both mirrors are **exactly parallel,** place peep gage, on rack or on floor, 70" from and approximately parallel to toe-mirror bar, (so it is on same elevation as the toe mirror bar). See Figure 17.

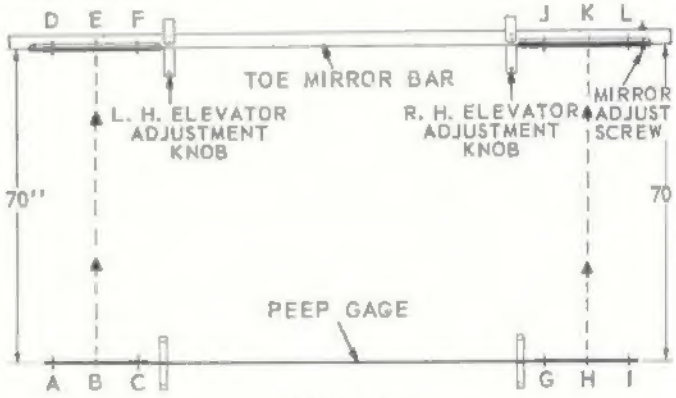


FIGURE 19

Referring to Figure 19, sight through **center hole of peep gage** (at point B) to see if **horizontal** line of cross at point B approximately lines up with **horizontal** line of cross at point E. If necessary, adjust **L. H. elevator adjustment screw** of toe mirror bar (Figure 20) to **approximately** line up the horizontal lines of the 2 crosses. Now **approximately** line up the **horizontal** lines of the two center crosses on the **right** side of the peep gage (points H & K) the same way you did on the left side. Adjust **R. H. elevator adjustment screw** if necessary.

Now, sight through **center** hole on **left** side of peep gage (Point B). Move peep gage slowly **sideways** until **vertical** line of center cross on peep gage (Point B) lines up perfectly with **vertical** line of center cross on the toe mirror (Point E).

Next, sight through **center** hole in **right** side of peep gage (Point H). Adjust **right** hand toe mirror with **allen screw** (Figure 21) so that, while viewing through **center** hole of peep gage (Point H), the

FIGURE 20

vertical line of center cross on peep gage (Point H) lines up perfectly with **vertical** line of center cross on toe mirror (Point K).

IMPORTANT: Recheck position of peep gage and toe mirror bar again. If the peep gage or mirror bar has been moved, line up points B and E and points H and K again as previously discussed.

Now, check **flatness** of mirrors, **being careful not to move peep gage or toe mirror bar even by touching.** Sight in **left** hole (on **left** side of peep gage), (Point A) to see if the **vertical** line of cross lines up with the **vertical** line of cross at Point D. Then, sight in **right** hole (on left side of peep gage), (Point C) to see if the **vertical** line of cross lines up with the **vertical** line of cross at Point F.

If the **vertical** lines of all three sets of crosses do not line up perfectly, the mirror has been **improperly installed,** causing a bind and therefore a curvature. To correct this curvature, due to binding, refer to assembly instructions, Section F, Page 5 applying to installation of the mirrors. **Readjust** toe-mirror bar and **recheck.**

Check out the set of holes on **right** side of peep gage in the same manner you did on the left side. (So vertical lines of crosses at Points G and J line up and vertical lines of crosses I and L line up.)

To assure consistently accurate toe alignment, this checking procedure of toe-mirror bar should be performed whenever the bar has been bumped or handled more roughly than normal and **also** it should be performed as a **periodic check** (preferably every 2 or 3 weeks).

FIGURE 21

11. **WE SUGGEST,** for precision wheel alignment and confidence in results, that the above checking operations be performed carefully at the time the equipment is originally set-up and any time afterward whenever some change in adjustment or set-up might have happened due to a droppage or accident with the equipment. This quick check procedure assures you that your equipment is accurate. **Clean** equipment is a good indication of **accurate** equipment.

12. **ALL LENS ADJUSTMENTS MUST BE MADE AT THE FACTORY:** If needed, you may quickly obtain from the factory a replacement projector head. Remove the projector head and center casting assembly by sliding top casting off rods (remove end screw in rod) and slide center casting off. Be sure to **keep** pressure pins, lamp unit, top and bottom castings with rods. (See Figure 22) Ship **ONLY** projector head and center casting assembly as a unit. (Take it to your jobber who will forward it to the factory in a suitable carton well padded and braced.)

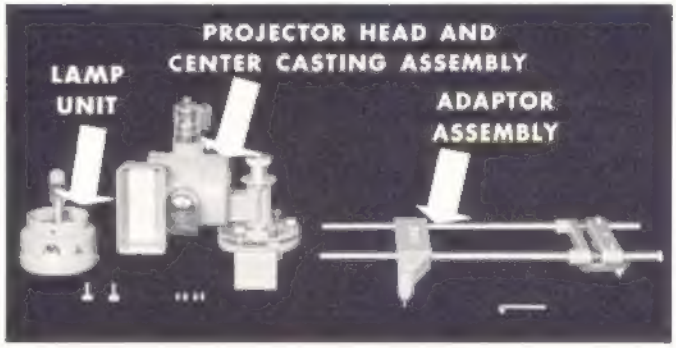


FIGURE 22

13. **TO CORRECT FOR DIMMING CONDITION OF LIGHT BEAMS: Inspect and clean outside** ends of **lenses** thoroughly with a very soft, damp cloth. (Note: A small spot of grease on the lens will dim a light beam considerably). Remove lamp unit and clean ends of lenses **inside** the projector head. Remove light bulb and check for cleanliness. Inspect to be sure filament is straight and centered in the bulb. Reinstall the bulb and check centering and squareness of the bulb. Install lamp unit so that it fits easily and squarely in the projector head. (If the bulb is knocked out of line, the light beam will appear very dull). Next, turn on switch and if after "focusing" (as described in Section 14, page 10), the light beams are still dim or have a part of the light line missing, (compare one projector with another for brightness) return to factory as described above, but only after thoroughly following above procedure to make certain that the projector is in need of factory service.

FIGURE 23

14. **TO "FOCUS" LIGHT BEAMS:** To "focus" light beam images, turn, raise or lower **positioning knob** on under-side of projector Lamp Unit. (See Figure 23) (Adjusting knob **revolves, raises or lowers** bulb socket so that bulb filament is in best position for superior projection of light). Adjust knob so that the reflection of the light beam on the **projector toe-scale** is bright and sharp. Also, bulb position can be adjusted for bright images while taking **extreme caster readings.** When reordering bulbs, specify No. L60-32.

15. **CARE OF PASSENGER CAR AND TRUCK BALL-BEARING TURNPLATES:** Do not disassemble turnplates. It is not necessary to grease or oil nylon ball bearings. **Do not grease.** To clean, occasionally blow out turnplates with compressed air. Keep out water and dirt.

•Using the LITE-A-LINE

(A) NECESSARY CHECKS BEFORE TAKING WHEEL ALIGNMENT READINGS:

Drive car to selected location and center it on the marked spots (See Figure 1). **Unload** vehicle. Accurately check and adjust **tire pressures.** Inspect for **unevenly worn** tires (Install best tires on the front.) Check for loose **wheel bearings,** loose or worn idler arms and ball joints and dragging brakes. Check for excessive run-out and out-of-round of wheels and tires. Check the sway bar, radius rods, front control arms and stabilizers for binding. Check all **springs** for sagging. Check for broken or weak shock absorbers. Also check for **loose** or bent rear axles, kingpins, tie rods, steering arms, pitman arm, spindle support points, tie-rod ends, steering wheel. A **thorough inspection** of all the above components is as important as the alignment measurements.

SHOP HINT: To drive car straight onto rack, pit, or location on floor, sight through center of windshield and along center of hood toward the center tube between the front charts or toward the center of the cabinet assembly.

Be sure to pull the hand brake tight (or firmly block rear wheels) **before** any front end checks. Be sure the wheels are **exactly** centered on turnplates.

NOTE: The order in which these instructions describe how to take readings is not the prescribed order in which to make adjustment. Refer to the **alignment instruction manual.**

FIGURE 24

(B) TO INSTALL PROJECTORS ON WHEELS:

Place bottom of projector adaptor on wheel rim by locating 2 extended rim screws on the wheel rim. Then, slide up to top cam-lock casting to engage top rim screw to wheel rim snugly. (See Figure 24.)

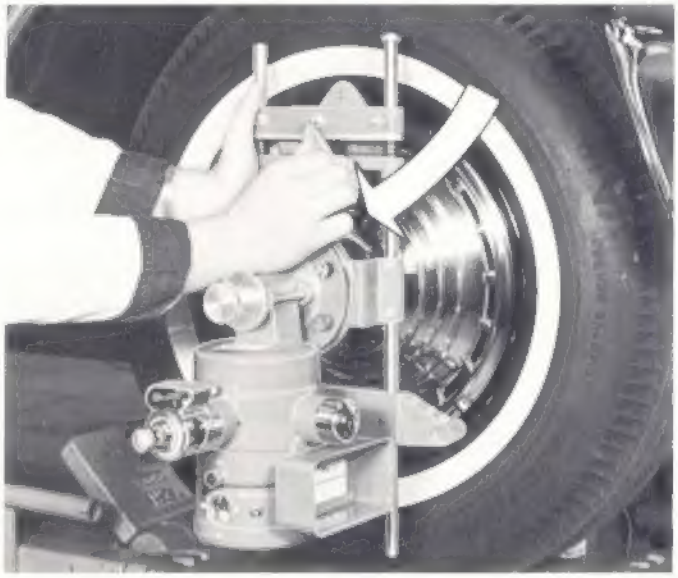


FIGURE 25

Make sure all 3 buttons are contacting the rim. Then, turn cam-lock with Allen wrench (See Figure 25). Test the security of the installation by lightly tugging on 2 bars—holding securely while doing so. Next, slide center casting up or down on the two bars to approximately center the bearing swivel with the wheel center.

To install projector on a cast aluminum wheel with no rim lip (such as Cadillac Eldorado aluminum wheels), remove top projector casting (the one with the cam-lock and L wrench socket) from projector rods. Then invert top casting and slide back onto rods. Move rim button to other hole provided on top casting. Install projector on cast aluminum wheel with the three rim button set-screws on the **outside** of the rim. (The locking action will be from the outside of the rim inward.)

For small diameter wheels, such as Corvair, first remove the 2 standard rod extensions. To do this, first loosen the 2 lower-casting screws with the L wrench, slide the lower casting towards the center-casting and with the L wrench in the hole in end of each rod extension, unscrew both rod extensions. Tighten the lower casting bolts. See Figure 26A showing rods with extensions removed.

When aligning a large truck, it is necessary to use the projector rod extensions and longer projector rim buttons supplied with each truck group (See Figure 26B).

FIGURE 26A

FIGURE 26B

(C) TO OPERATE THE RUN-OUT COMPENSATOR:

The run-out compensator corrects for **all factors,** such as bent rim, lateral run-out of wheel and even a bent projector adaptor. When the compensator is properly adjusted, the plane of the light beams is absolutely perpendicular to the **true-axis of the wheel.** Jack up one front wheel to clear turnplate. Plug light cord into projector. Adjust the 3 compensator screws to **NEUTRAL POSITIONS** (with the ball ends of the screws visible) and loosen the lock knob. (See Figure 27) Slowly revolve wheel gently by using two hands and observe **sideway oscillation** of vertical light beam on chart. Slide chart or change angle of

FIGURE 27

vehicle wheel so the vertical light line oscillation is at approximately equal amounts on **both sides** of the vertical red toe line.

Stop wheel when the vertical light line is at **one extreme end** of oscillation. Adjust proper compensator screw to bring light line almost, but not quite, to red toe ine. (See Figure 27)

SHOP HINT: Compensating can be done quickest by always adjusting **only** a compensator screw that is **exactly in front or in back** of the center of the projector swivel. If necessary, revolve wheel slightly to bring a screw in one of these positions

Then revolve wheel until the light beam is at **other extreme** of oscillation and adjust proper compensator screw.

Again slowly move wheel angle or slide chart so that the light beam oscillation is approximately equal on both sides of red toe line and repeat the compensating adjustment.

NOTE: The wheel will wiggle sideways very easily when jacked-up in this position and must be revolved very **gently** by hand at the **top** of the wheel with short strokes as not to cause oscillation from wiggling rather than runout. A dragging brake will make wheel hard to revolve and hard to compensate. (The compensator can be adjusted to completely eliminate oscillation, but this is unnecessary.)

When the oscillation has been reduced to about 1/16" or less with the compensator screws, revolve wheel manually and stop wheel at **exact center of oscillation.** Hold the wheel at this position and mark **top** of tire with chalk, so that if wheel is jacked up for adjustments later on, the wheel can be lowered to same position, eliminating re-compensating. Then lower the wheel onto the turnplate. (Before lowering wheel, if necessary, shift turnplate so that wheel will contact **center** of turnplate.)

FIGURE 28

Then, raise horizontal light line to the **red level line** on the chart, by tilting projector head, and snug up on lock knob. (See Figure 28). Do this on both wheels. Bounce front end of car by leaning on bumper—this settles car on springs.

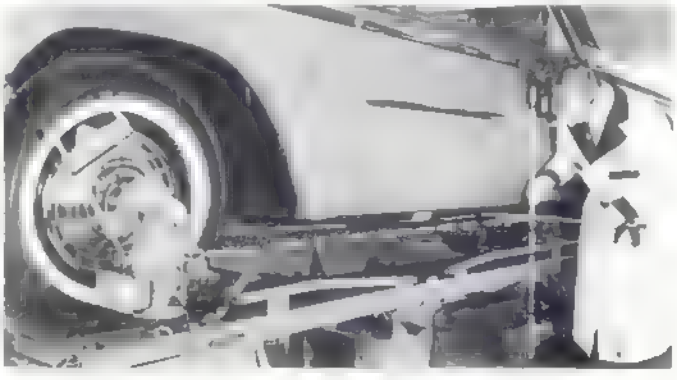


FIGURE 29

(D) TO SET WHEELS FOR STRAIGHT-AHEAD POSITION:

To set wheels in **accurate** straight-ahead position and to also position the front charts with respect to the **center of the car,** first set the wheels in an approximate straight-ahead position. Then measure the **distance** from where the light beams cross to **corresponding spots** on each side of the car, such as the frame. (See Figure 29). Then, adjust steering wheel to equalize these two dimensions.

SHOP HINT: An easy way to do this is to hold a scale or your brake depressor against the left side of the vehicle frame, about 70" in back of front wheel center (See Figure 29), and pencil-mark the spot intersected by the light beam. After you get a similar marked spot from the other side of the vehicle, put a pencil mark in the middle of the two marks, and adjust the steering wheel to move the light beam on the middle mark

The **wheels** are now in a straight-ahead position. However, the steering wheel may not be in the proper position and this is adjusted when center-steering is discussed later. Adjust both **front charts** so that red toe lines are **centered** where the light beams cross. The charts are now centered with the vehicle.

The operation is very necessary to make the 20° turns as accurate as possible by starting from a **centered position.** If the vehicle shifts to either side on the turnplates the light beams will not cross on the **red toe lines** on both front charts. When the wheels are straightened forward, make a 20° turn to each side and see if vehicle centers itself again. If not, slide front of vehicle on turnplates to return to original position.

SHOP HINT: The hand brake must be tight (or rear wheels firmly blocked for cars which have a hand brake on the transmission) to keep vehicle in centered position

YOU ARE NOW READY FOR WHEEL ALIGNMENT READINGS: Do not attempt to make any adjustments until you have first taken and recorded all readings on your check sheet. Be sure to read **Alignment Instruction Manual** for valuable information. It should be emphasized that obtaining **consistently** accurate readings with the Lite-A-Line is the key to perfect wheel alignment.

FIGURE 30

The following is the proper order to make adjustments: Caster, camber, toe, center-line steering, wheel track. (A caster change affects camber; camber change affects toe-in.)

(E) TO CHECK CAMBER:

First set wheels in straight-ahead position. With the **horizontal** light line crossing approximately on the **level line,** slide left front chart sideways so that the **bottom end of the vertical** light line centers on the **red dot** at the **camber base.** (See Figure 30). (For example—Figure 30 shows a reading of nearly 1½° positive camber on left wheel.)

The camber, or lean, of the wheel can now be noted in degrees on the **camber scale.** (Camber is read by use of only the vertical light line, using the entire length of the line.)

NOTE: All readings **other than camber** are taken at the intersection of the vertical and horizontal or the two diagonal light beams, which are focused on the charts

(F) TO CHECK FRONT TOE:

With wheels in straight-ahead position, (as in Section D, Page 11), the toe mirror bar positioned directly in back of front charts as shown in Figure 1 and Figure 17, both projectors adjusted for compensation and with vehicle on turnplates, then tilt **left** hand projector so that **horizontal light line** is positioned on **side red marks** next to toe window on **left** front chart. (See Figure 31).

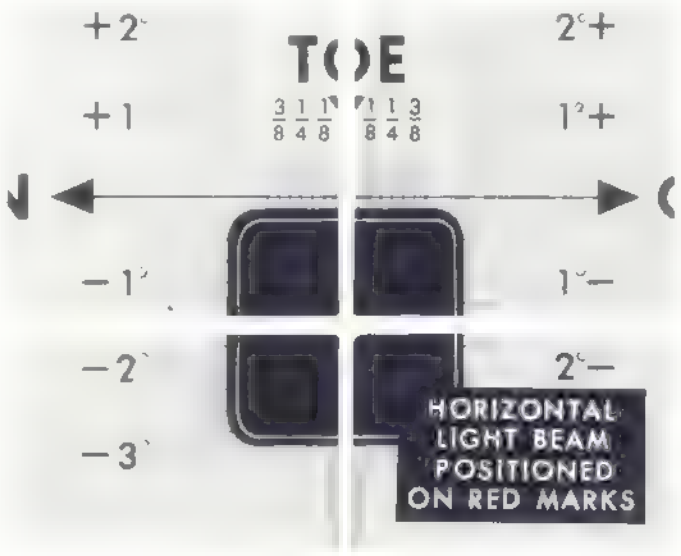


FIGURE 31

Tighten lock knob to hold projector in this position. **Slide left hand leg** of toe mirror bar so that the **vertical** line of the light beam is **centered** on the **vertical level line** on the **projector toe scale,** (See Figure 32), and at the same time **slowly** turn left-hand toe-mirror bar **elevator adjustment screw,** (See Figure 8), so that the **horizontal** line of the light beam is **centered** on the **horizontal** line of the **projector toe scale.** (See Figure 32)

Next, slide **left** front chart so that the **vertical** line of light beam is **centered** on **zero toe line** of front chart.

Tilt **right** hand projector so that **horizontal** line of beam is centered on **side red marks** next to toe window on **right** front chart, (See Figure 31). Tighten the **lock knob** to hold projector in this position.

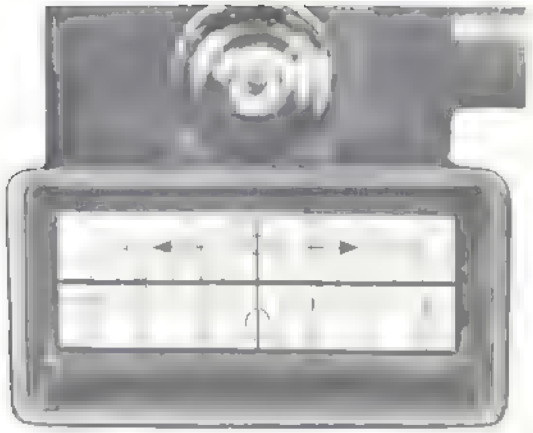


FIGURE 32

Now, **slowly** turn right hand toe-mirror bar **elevator adjustment screw** so that the **horizontal** line of the light beam is **centered** on the **horizontal** line of the **projector toe scale.** (See Figure 33.)

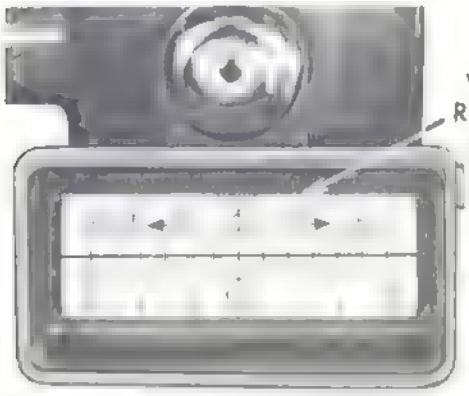


FIGURE 33

Recheck left hand projector to make certain that the light beam is still centered on both the **vertical zero toe line of the front chart** and the **vertical zero toe line** of the projector toe scale.

Now observe **toe reading** on the **right hand projector toe scale.** This is the actual toe reading (before making any adjustments). Center vertical light line on zero toe line of left hand chart by sliding left chart. (Figure 34). Now slide **right hand front chart** so reading on chart corresponds to reading you have on **right-hand projector toe scale.** Disregard toe reading on R.H. projector toe scale and observe **only** front chart toe-reading while making toe adjustments underneath vehicle. Keep the left vertical light beam centered on the vertical zero line of left front chart.

FIGURE 34

If wheels have more than ⅜" toe, relocate left vertical light line on left hand projector toe scale (by moving left mirror bar leg) (Figure 35) to show some toe reading on this scale. Observe toe reading on right hand projector scale. Toe will then be the sum of the left and right readings. Example: Left hand scale reads ¼" toe-in Right hand projector scale reads ⅜" toe-in. (Total toe-in is ⅝").

NOTE: When making more than ¼" toe adjustments, consider the effect that making all of the adjustments on only **one** tie-rod end has on the center-line steering. To adjust both tie-rod ends without affecting center-line steering, first set your front charts to show one half of the toe reading on each chart and then adjust both wheels equal amounts, and the actual toe reading will be the sum of the two toe readings on each front chart.

Example: If reading is ⅜" toe-in and ⅛" toe-in is desired, slide both charts so each light beam reads 3/16" toe-in. Then adjust each wheel to read one-half of desired toe, or 1/16" on each side. The total toe reading will be ⅛" toe-in.

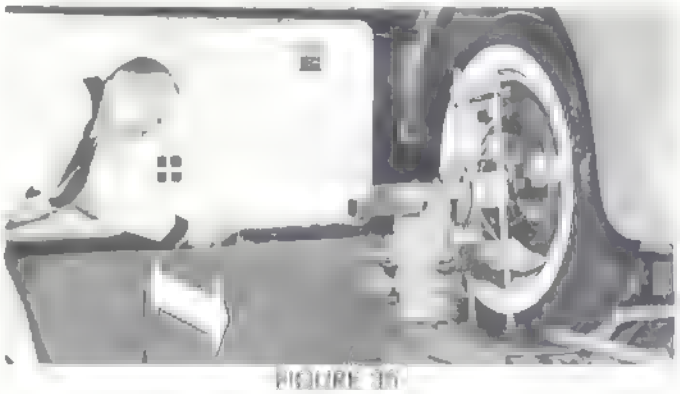


FIGURE 35

(G) TO CHECK CENTER-LINE STEERING:

First, set the front wheels in an accurate, straight-ahead position as explained in Section D, Page 11.

By observing the steering wheel spokes, you will note whether or not you have center-line steering. If the steering wheel spokes are not in a normal straight-ahead driving position, turn steering wheel so that the spokes are in proper position. This will move the light beams off the red toe lines on the front charts. Observe where your readings are on the front charts (the number of spaces to the right or left of the zero red toe lines). Center-line steering adjustments may then be made by shortening and lengthening the proper tie-rod ends to bring the left front light beam back to red zero toe line and the right front light beam to the correct toe reading line on the right front chart.

SHOP HINT: To check centering of **steering gear on worm,** turn the steering wheel to one limit, then count the whole turns and fraction of a turn to the other limit. Turn the wheel back halfway and check alignment of **steering wheel** and **pitman arm.** When these three parts are in line, precise center steering can be obtained, provided parts have not been bent.

(H) TO CHECK TURNING ANGLE:

Start with wheels in the straight-ahead position and with light beams centered on the **toe lines.** Turn the left wheel to right to bring light beam from left wheel to the **20° turn** line on inside of **left front** chart (See Figure 36).

Read turning angle of **right wheel** on right front chart (See Figure 36). Repeat operation for turning angle of left wheel.

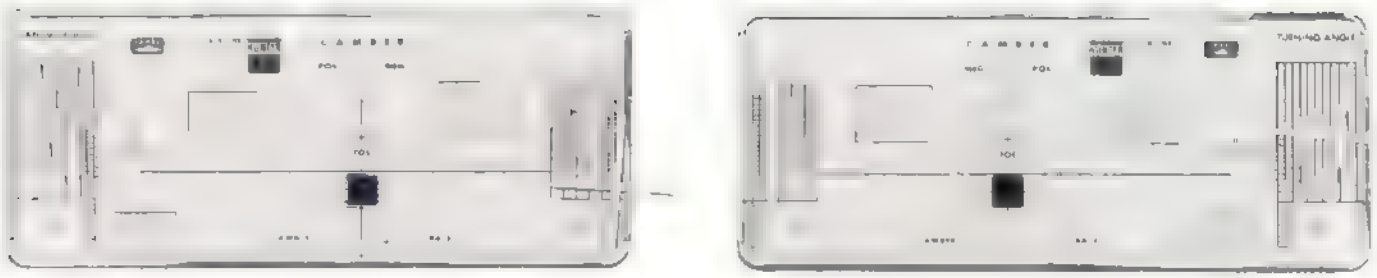


FIGURE 36

TURNING ANGLES, OUTSIDE WHEELS LESS THAN 20°: Turn right wheel to outside 20° on right side of right chart. Read angle for left wheel on **right** side of **left** chart (15° - 20°). Repeat operation for opposite wheel.

SHOP HINT: For most accurate turning angle readings, we suggest to first jack up both front wheels barely above turnplates (use a pair of jacks) and also lock brakes with pedal depressor.

NOTE: With wheels jacked-up, when performing a **20° turn** for caster, king-pin inclination and turning angle readings, turn the steering wheel with short, vertical arcs on the side of the wheel. Avoid moving vehicle sideways as this will cause changes in readings; use caution when making 20° turns to assure vehicle **does not move sideways.**

(1) TO CHECK CASTER:

With the wheels first in a straight-ahead position, center charts to bring vertical red lines to center on vertical light lines.

1. With wheel at 20° turn (see Figure 37) first, snug projector lock-knob, then level caster-level, and adjust **"X"** light-line to zero, by turning knob on top of caster adjustment unit
2. Loosen lock-knob, and swing wheel to bring "+" light-line to opposite 20° turn line on same chart.
3. Snug lock-knob, and level caster-level again. Read **"X"** light-line for caster on Neg. Caster or Pos. Caster scale. (See Figure 37)

Repeat operation on other chart for opposite wheel.

TAKING CASTER WITH TRUCK CHARTS:

When working with truck charts, it is important to have the sliding-scales set for proper wheel sizes (See Figure 36A). If the wheel diameter is less than 19 inches; which is the case on passenger cars and light trucks, the ⟷ of the four sliding-scales are moved up to ⇧ .

On larger trucks, where the wheels are 19 inches and over, the ⟷ of the four sliding scales are moved to ⇩ .

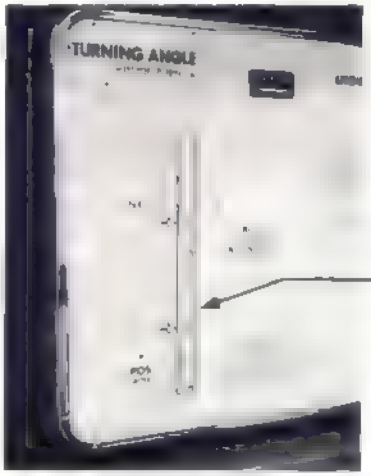


FIGURE 36A
(Illustration of sliding scale, on truck charts only, for compensating for different truck wheel sizes.)

After sliding-scales are set for proper wheel size and wheels are in straight-ahead position, move the charts to the vertical red lines in order to center them up on the vertical light lines. Turn front wheel to bring **"+"** light beam to a 20° turn line on one chart then as follows:

1. Snug projector lock-knob, then level caster-level, and adjust **"X"** light line to ⟷ on scale. Remember! The scale is set at two different positions, depending on wheel size. Also, be sure that all four scales (two on each chart) are set at same positions.
2. Loosen lock-knob, and swing wheel to bring **"+"** light-line to opposite 20° turn line on same chart.
3. Snug-lock-knob, and level caster-level again. Read **"X"** light-line for caster on Neg. Caster or Pos. Caster scale.

Repeat operation on other chart for opposite wheel.

TURNING OFF CASTER "X" LITE-LINE: While taking other alignment readings the **"X"** caster light may be turned off by screwing in caster **adjustment knob.**

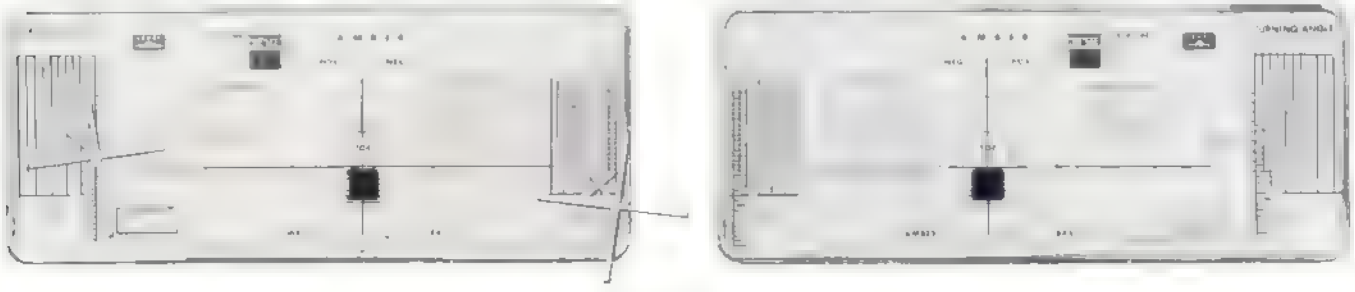


FIGURE 37

When making **caster adjustments,** it is not necessary to swing wheels to 20° turn lines again. Use caster scales located in center of each chart. (See Figure 37.)

1. Lock brakes with pedal depressor.
2. Lock projector knobs after tilting projector to bring the horizontal light lines to the actual predetermined caster readings. By observing these center caster scales you will then be able to determine in which direction and to how much caster adjustment you are making.

Make sure jacks do not leak as this will cause changes in readings. Also take up slack in brake assemblies as explained in next Section, J.

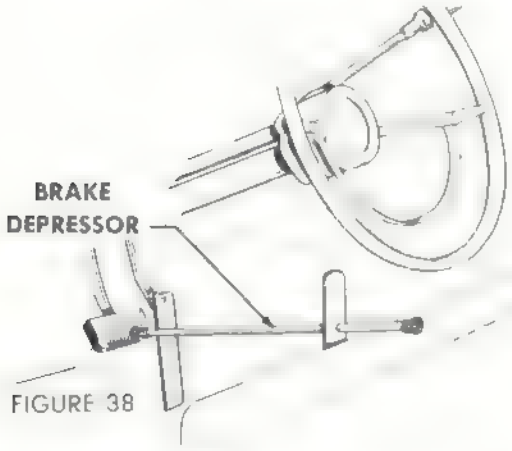


FIGURE 38

(J) TO CHECK KING-PIN INCLINATION:

It is ONLY necessary to TIGHTLY LOCK the front wheel brakes with the brake pedal depressor (Figure 38). Jack up both front wheels evenly just free of the turn-plates. (Be sure jacks do not leak, as this will cause bad readings—use blocks, if necessary.)

NOTE: In determining king-pin inclination, it is **very important** that **front wheels are locked** when making the 20° turns. Therefore, if the hydraulic brake system is not in good condition and if brakes loosen while readings are being taken, it is best to lock the front wheel shoes tightly by brake adjustment. The following procedure will eliminate the slack in the brake assembly. On trucks with no front wheel brakes, T61-22-S wheel stop can be used to keep wheels from revolving.

From a straight-ahead position turn steering wheel to the right so that the left **front light** beam is on the 20° turn line at the inside of the left front chart. (See Figure 39.) Rotate the left front wheel in a forward running direction against the locked brakes until the slack in the brake assembly is eliminated in this direction. Then, tilt left **front** projector head so that the light beam crosses on the **zero line** of the left front chart and lock in position with the lock knob. (See Figure 39)

NOTE: When working with truck charts, first place ◂⊖▸ of four slides to ⇨ ; as noted in "Kingpin Slant" instruction box on charts.

Using the steering wheel, turn the wheels to left until **left** front light beam is on the 20° turn line at the **outside of the left** front chart. Again rotate the wheel against the locked brakes in the same direction. Read king-pin inclination on the left front chart (See Figure 40). Repeat this operation for the right wheel.

NOTE Do not jar projector head or wheel when turning so that the projector might swing even though lock knob

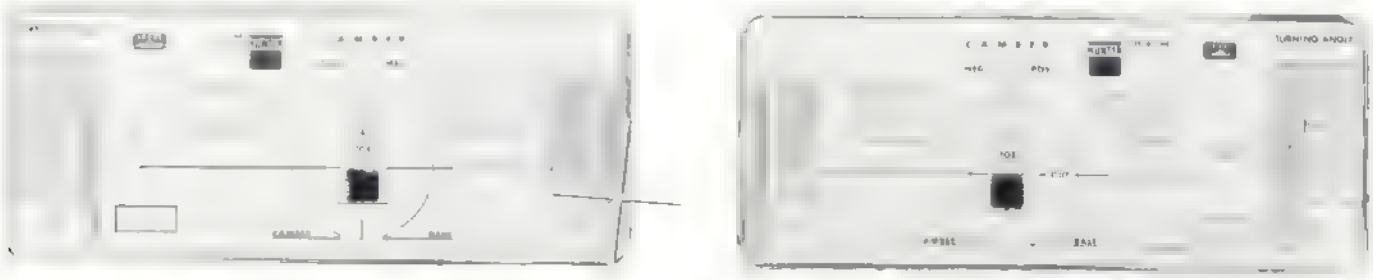
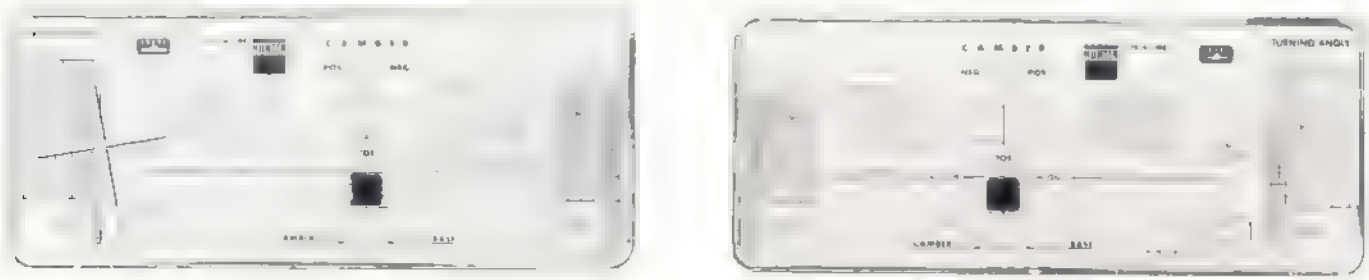


FIGURE 39



THIS EXAMPLE SHOWS A 7° KING PIN INCLINATION.

FIGURE 40

is tightened. This would cause a bad reading. Check by returning to initial 20° turn and see if light beam is still on zero (Be sure to take up brake slack as before).

IMPORTANT: King-pin inclination is not an absolute angle. Included angle must be computed (see below) when king-pin inclination and camber readings are taken at the same time and under the same conditions.

(K) TO CHECK INCLUDED ANGLES:

The **included angle** (or king-pin slant specified at 0° camber) must be **calculated** by adding the positive **camber** reading to the **king-pin inclination** reading. (Subtract a negative camber reading.)

NOTE: Both camber and king-pin inclination should be taken at the same time with wheels jacked-up. Any adjustment in camber changes king-pin inclination but not included angle. It is known that if the camber and caster readings are within adjustable limits, there are probably no bent parts and the king-pin inclination is normal, since a change in king-pin inclination would necessarily affect the camber readings. Since a change in camber **changes** the king-pin inclination, king-pin inclination angles are not the absolute angle. Therefore, the manufactured angle between the king-pin (or ball sockets) and the spindle, which is called the **included angle,** is the actual absolute angle that should be computed.

However, an unusual feature of the Lite-A-Line will enable you to obtain **absolutely** accurate included angle measurements. Follow this procedure carefully and you can eliminate many factors which cause erroneous included angle readings: Block rear wheels (or pull hand brake tight), and jack up both front wheels just free of turn plates. Be sure jacks do not leak, slowly lowering car —this will cause bad readings. Install the projector and carefully compensate for run-out. Lock brakes with pedal depressor. First set wheels in straight-ahead position and center up front charts, as described in Section D, Page 11. Take **king-pin inclination** readings and **camber** readings very carefully. (Be sure to take up brake slack.) Compute the included angle.

FIGURE 41

(L) TO CHECK REAR WHEELS:

It is not necessary to reverse position of vehicle. If necessary, remove fender skirts, jack up rear wheels and install projectors. **Compensate** for run-out (Figure 41) as was done on front wheels, by using toe gage or pendulum flag as a reference. Lower wheels onto floor (or rack).

SHOP HINT: On cars which have independent rear wheel suspension, it is necessary to bring rear wheels to normal camber angle position, after lowering vehicle from a jacked-up position. This can be accomplished on turnplates or on Hunter alignment racks, by jouncing rear end of vehicle.

FIGURE 42

(M) TO CHECK WHEEL TRACK:

After compensating, hold your pedal depressor, about 70" ahead of rear wheel, against one side of vehicle or chassis and pencil-mark the spot intersected by light beam. After you get a similar marked spot from the corresponding spot on the other side of the vehicle, observe the difference in the two pencil marks. This differential will indicate whether or not vehicle is tracking properly. (See Figure 42) This operation is similar to setting front wheels in straight-ahead position.

The track measurement is very **unique** in the field of wheel alignment for **accuracy,** and in the truck alignment field all axles of tractor, semi-trailer and trailers can be aligned to the utmost precision with the Lite-A-Line (See Figure 43).

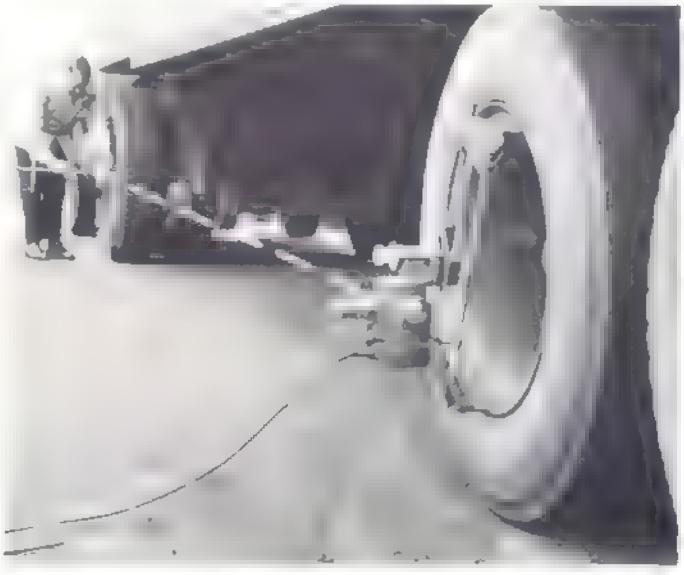


FIGURE 43

When an axle is checked and does not have any looseness and the camber and toe-in are within specifications, it is straight and operating properly. When run-out compensation is made carefully, the tracking of an axle can be measured and adjusted perfectly to any desired condition.

NOTE: For best vehicle performance, track measurement should be within ½ inch

(N) TO CHECK REAR END CAMBER:

For camber of rear axle, a pendulum flag, which is provided as optional equipment, is placed at the rear of the car. The camber is read on the center-line of pendulum. (See Figure 44). Taking rear camber is similar to taking camber on front wheels.

NOTE: Always make sure tire pressures are correct.

With stationary-type aligner groups, a WA86-S goose-neck type pendulum is provided. With floor, power rack, lift or pit type groups, a WA85-S pendulum is used. (See Figure 44).

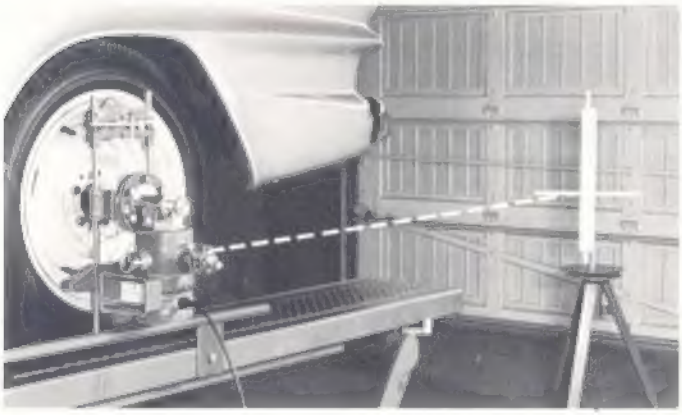


FIGURE 44

(O) TO CHECK REAR END TOE:

(The L80-3-S rear toe gage is available as optional equipment at extra cost.) Move the rear toe-gage about 70" ahead of the center of rear wheels. (Figure 45). After centering the light beams on the 2 flags, take reading on the tread scale.

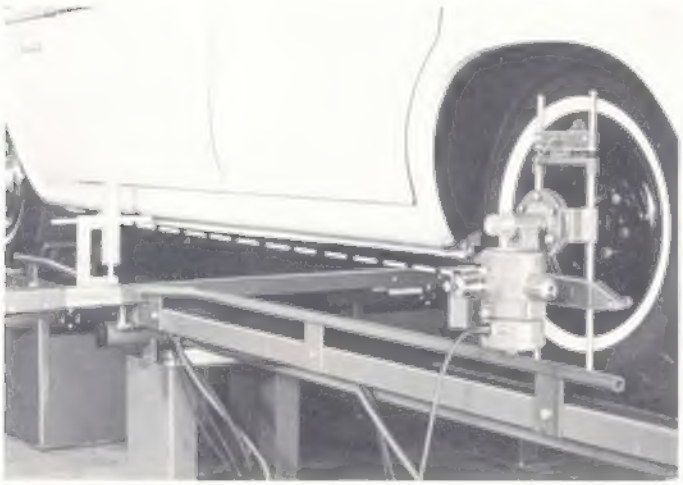


FIGURE 45

Then **move** the rear toe gage to the same distance **behind** the rear wheels and center the light beams on the fixed flag. (See Figure 46). Set the tread scale to the same reading, and read toe-in or toe-out on flag and **divide the reading in half.**

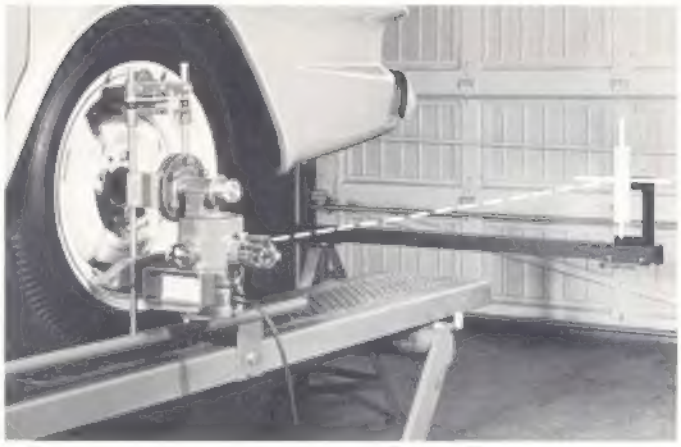


FIGURE 46

CHECKING TOE ON VEHICLES WITH INDEPENDENTLY-SPRUNG REAR WHEELS (such as Corvair).

A. **Using Model L-80-3-S Rear Toe Gage** (Figure 47)— First, jack up rear wheels and compensate; then check rear wheel track (see Sec. M, Page 16). Adjust track within ½" tolerance, if necessary.

Now, check toe as outlined in Section O, Page 17. Be sure to **divide toe reading in half.**

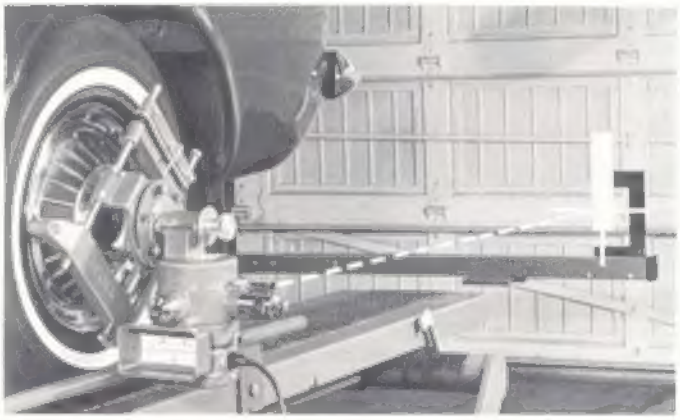


FIGURE 47

B. **If Model L80-3-S Rear Toe Gage is not available** (Figure 48)—

First, check rear wheel track as in Paragraph A above. Then, using a straight stick at least 7' long in place of the rear toe gage, follow same procedure for checking toe as above in Paragraph A, except chalk-mark the vertical light lines made by projector beams on the stick. The difference in the front and rear readings will be the toe-in or toe-out. Now, measure this difference with a scale or a ruler. Place scale or ruler on **toe scale** section of right front chart and convert above measurement to chart toe scale measurement. **Divide this last reading in half**—this is your toe reading.

Example:

If actual toe reading on the stick is ¾" toe-in, measure ¾" on front chart **toe scale** as shown in Figure 31. This measurement would show 5/16" on the chart toe scale. Now, **divide the 5/16" reading in half**—your reading would be 5/32" toe-in.

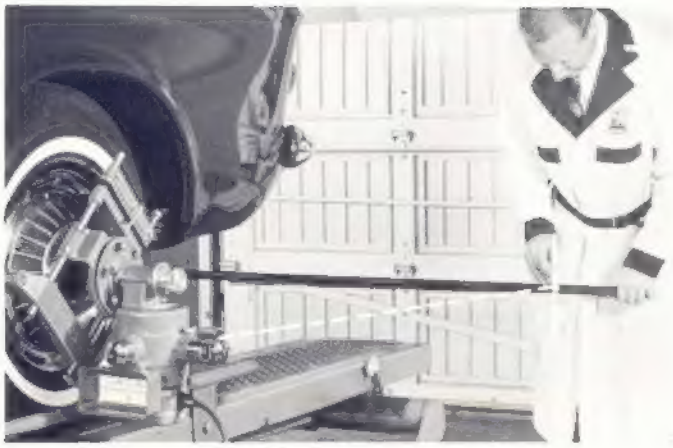


FIGURE 48

(P) CHECKING TOE OF EACH WHEEL ON INDEPENDENTLY SPRUNG REAR WHEELS:

Some vehicles with independently-sprung rear wheels, such as Volkswagen, have toe specifications for **each** rear wheel. To obtain **this** type of toe reading, please refer to Instruction Form 465T.

(Q) TO CHECK FOR BENT FRAME:

When checking for a bent frame, please refer to Hunter Alignment Manual, Form 159T, for complete information.

(R) TO COMBINE CASTER, TURNING ANGLE AND KING-PIN INCLINATION FOR ACCURACY:

These three readings may be taken simultaneously and with great accuracy. However, it is advisable to practice them separately until you are able to combine the three. To do this, install brake pedal depressor, make the **initial inside 20° turn** of the left wheel on the left front chart, set caster **"X"** light line at **zero line** and take up brake slack. Set **"+"** light beams on zero line, **read turning angle** of right front wheel. Swing to outside 20° turn on left front chart, **read caster** and **read king-pin inclination** of left front wheel. Repeat this operation on right side. To double-check the readings, do each side again, to make sure all readings repeat themselves accurately. Use all shop hints and procedures described previously in Sections H, I and J.

(S) TO COMBINE TOE-IN AND CENTER STEERING:

With front wheels in straight-ahead position and with the toe reading taken as explained in Section F, Page 12, record toe reading shown on R. H. projector toe scale and slide both front charts so that each one reads ½ of the toe reading shown on the projector toe scale. Now, straighten steering wheel so that the spokes are in a straight-ahead position and adjust each tie rod sleeve so that each toe reading is ½ of the toe reading desired. (½ of the toe on each wheel will result in the **total toe** reading required). Finally, tighten the tie rod sleeves.

Example:

If toe reading shown on R.H. projector toe scale is ¼" toe-in, and the desired toe reading is ⅛" toe-in, slide both front charts so that each chart reads ⅛" toe-in. Straighten steering wheel position and adjust each tie-rod sleeve so each wheel reads 1/16" toe-in. (Your total toe reading is 1/16" plus 1/16" or ⅛" toe-in and you also have center line steering.)

NOTE: The toe projector scales are calibrated when the left light beam is on zero and all toe-in readings must be taken as a separate reading. The combined method is for convenience in making adjustments. The toe-in and center-steering measurements are **extremely accurate,** especially with run-out compensation so accurate. In new car service and truck alignment, these two readings and adjustments are the most important and therefore most precise with the Lite-A-Line.

An alignment job can be easily peformed in these ten quick steps, on new or low mileage vehicles.

1. First, position car toward Lite-A-Line and set emergency brake tight.
2. Check the air pressure in tires and be sure vehicle is unloaded. (Since loading changes vehicle geometry, if a car is to be operated all of the time with a certain amount of load in the back or trunk, it is advisable to align it when so loaded.)
3. Jack up the front wheels 1½ inches.
4. Check wheel bearings and brakes for adjustment.
5. Install projectors and compensate for run-out.
6. Lower wheels onto centers of turnplates and settle car on springs.
7. Check and adjust caster.
8. Check and adjust camber.
9. Check and adjust toe-in.
10. Check and adjust center-steering.

With the Hunter Lite-A-Line, you own the most profitable and accurate wheel aligner on the market. If it is checked, installed and operated properly, as outlined in this Instruction Manual, you will be able to furnish your customers with the best wheel alignment jobs possible.

HUNTER *Engineering Company*

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